# PATENT ABSTRACTS OF JAPAN

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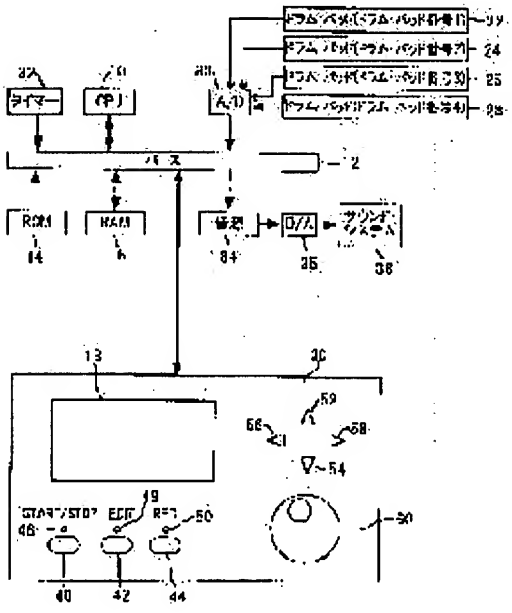
## (54) ELECTRONIC PERCUSSION INSTRUMENT



(57)Abstract:

PROBLEM TO BE SOLVED: To change over an automatic play pattern without spoiling performance of percussion instrument play by a player by beating a drum pad so as to become a beat pattern conformed to a trigger pattern corresponding to every drum pad to change over the automatic play pattern.

SOLUTION: When whichever drum pad within a plurality of drum pads 22-28 is beated, the beat pattern of the drum pad is compared with a trigger pattern stored in a trigger pattern storage means (RAM 16) and corresponding to the beated drum pad. When the result of comparison shows coincidence of the beat pattern with the trigger pattern, an automatic play pattern during automatically playing at present is changed over to whichever automatic play pattern stored in an automatic play pattern storage means (ROM 14). The automatic play is performed following to the changed-over automatic play pattern.

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

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## DESCRIPTION OF DRAWINGS

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[Brief Description of the Drawings]
[Drawing 1] It is the block configuration explanatory view showing an example of the gestalt of operation of the electronic percussion instrument by this invention.
[Drawing 2] It is the explanatory view showing the DS of a pad buffer in graph.
[Drawing 3] It is the explanatory view showing the score which the clock timing data of an example of the data configuration of a trigger pattern and a trigger pattern show.
[Drawing 4] It is the explanatory view showing the DS of an accompaniment pattern in graph.
[Drawing 5] It is the explanatory view showing the DS of the variable group for every drum pad in graph.
[Drawing 6] It is the explanatory view showing notionally correlation with a drum pad, a trigger pattern, and an accompaniment pattern.
[Drawing 7] It is the explanatory view showing the DS of the various register groups of RAM in graph.
[Drawing 8] It is the explanatory view showing a data format of Register padreg (pad register) in graph.
[Drawing 9] It is the flow chart which shows a main routine.
[Drawing 10] It is the flow chart which shows a pad interrupt handler.
[Drawing 11] It is the flow chart which shows a timer interrupt handler.
[Drawing 12] It is the flow chart which shows a comparison manipulation routine.
[Description of Notations]
10 Central Processing Unit (CPU)
12 Bus
14 Read Only Memory (ROM)
16 Random Access Memory (RAM)
18 Drop
20 Control-Panel Section
22 Drum Pad (Drum Pad Number 1)
24 Drum Pad (Drum Pad Number 2)
26 Drum Pad (Drum Pad Number 3)
28 Drum Pad (Drum Pad Number 4)
30 ANAGURO/Digital Converter (A/D)
32 Timer
34 Sound Source
36 Digital One / ANAGURO Converter (D/A)
38 Sound System

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## DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to the electronic percussion instrument which can generate musical sound according to the blow to the drum pad which equipped the detail with the blow side further about an electronic percussion instrument.
[0002]
[Description of the Prior Art] Electronic percussion instruments, such as an electronic drum kit which a player hits two or more drum pads equipped with the blow side which pronounced the musical sound of a predetermined percussion instrument according to the blow using both-hands both guide pegs, and enabled it to perform a percussion instrument performance, are known carrying out an automatic performance in the field of an electronic percussion instrument conventionally according to automatic performance patterns, such as an accompaniment pattern beforehand memorized with the automatic performance means.
[0003] By the way, such a conventional electronic percussion instrument memorizes two or more automatic performance patterns general beforehand, and is made as [ carry out / the automatic performance pattern of these plurality is switched suitably, and / an automatic performance ].
[0004] And the switch of an automatic performance pattern which carries out an automatic performance was performed, when a player hit with a stick etc. the specific drum pad beforehand set up as an object for a switch of an automatic performance pattern out of two or more drum pads or steps on and operated on foot handlers, such as a foot switch beforehand set up as an object for a switch of an automatic performance pattern.
[0005] However, it sets to the conventional electronic percussion instrument which was described above. To the midst which hits a drum pad and is carrying out the percussion instrument performance while carrying out an automatic performance according to an automatic performance pattern with a player When the automatic performance pattern under automatic performance needs to be switched to another automatic performance pattern In spite of the midst of a percussion instrument performance, the player had to hit with the stick etc. the specific drum pad set to the switch of an automatic performance pattern for whenever [ the / every ], or had to step on the foot switch on foot, and had to switch the automatic performance pattern.
[0006] That is, since performing actuation unrelated directly [ the percussion instrument performance of hitting a specific drum pad or stepping on a foot switch etc. ] would be forced in the midst of a percussion instrument performance of the player himself in the conventional electronic percussion instrument in order to switch an automatic performance pattern, there was a trouble that there was a possibility of spoiling the performance nature of a percussion instrument performance as the result.
[0007]
[Problem(s) to be Solved by the Invention] The place which this invention is made in view of the trouble which a Prior art which was described above has, and is made into the purpose tends to offer the electronic percussion instrument which enabled it to switch an automatic performance pattern, without spoiling the performance nature of the percussion instrument performance by the player.
[0008]

[Means for Solving the Problem] In order to attain the above-mentioned purpose, among this inventions invention according to claim 1 In the electronic percussion instrument which generates musical sound according to the blow to the drum pad equipped with the blow side A trigger pattern storage means to memorize a trigger pattern corresponding to each of two or more drum pads equipped with the blow side, and two or more above-mentioned drum pads, respectively, An automatic performance pattern storage means to memorize two or more automatic performance patterns, and the blow pattern of the drum pad hit among two or more above-mentioned drum pads, A comparison means to compare the trigger pattern corresponding to the drum pad hit in the trigger pattern memorized by the above-mentioned trigger pattern storage means, The blow pattern of the drum pad with which the comparison result by the above-mentioned comparison means was hit among two or more above-mentioned drum pads, When coincidence with the trigger pattern corresponding to the drum pad hit in the trigger pattern memorized by the above-mentioned trigger pattern storage means is shown The switch means which switches the automatic performance pattern under automatic performance to the automatic performance pattern of either of the automatic performance patterns memorized by the above-mentioned automatic performance pattern storage means, It is made to have an automatic performance means to perform an automatic performance according to the automatic performance pattern switched by the above-mentioned switch means.

[0009] Therefore, if the drum pad of either of two or more drum pads is hit among this inventions according to invention according to claim 1 The trigger pattern corresponding to the hit drum pad concerned which was memorized by the blow pattern of a drum pad and trigger pattern storage means concerned which were hit is compared. When the comparison result shows coincidence with a blow pattern and the trigger pattern concerned concerned Since the automatic performance pattern under current automatic performance will switch to the automatic performance pattern of either of the automatic performance patterns memorized by the automatic performance pattern storage means An automatic performance pattern can be switched by hitting a drum pad so that it may become the blow pattern which is in agreement with the trigger pattern which corresponded for every drum pad.

[0010] Among this inventions, moreover, invention according to claim 2 In the electronic percussion instrument which generates musical sound according to the blow to the drum pad equipped with the blow side A blow pattern storage means to memorize the blow pattern of the drum pad hit among two or more drum pads equipped with the blow side, and two or more above-mentioned drum pads, A trigger pattern storage means to memorize a trigger pattern corresponding to each of two or more above-mentioned drum pads, respectively, An automatic performance pattern storage means to memorize an automatic performance pattern corresponding to each of two or more above-mentioned drum pads, respectively, A comparison means to compare the blow pattern memorized by the above-mentioned blow pattern storage means with the trigger pattern corresponding to the drum pad hit in the trigger pattern memorized by the above-mentioned trigger pattern storage means, The blow pattern with which the comparison result by the above-mentioned comparison means was memorized by the above-mentioned blow pattern storage means, When coincidence with the trigger pattern corresponding to the drum pad hit in the trigger pattern memorized by the above-mentioned trigger pattern storage

means is shown It is made to have an automatic performance means to perform an automatic performance according to the automatic performance pattern corresponding to the pad hit in the automatic performance pattern memorized by the above-mentioned automatic performance pattern storage means.
[0011] Therefore, if the drum pad of either of two or more drum pads is hit among this inventions according to invention according to claim 2 The trigger pattern corresponding to the hit drum pad concerned which was memorized by the blow pattern of a drum pad and trigger pattern storage means concerned which were hit is compared. When the comparison result shows coincidence with a blow pattern and the trigger pattern concerned concerned Since the automatic performance which followed the automatic performance pattern corresponding to the hit pad concerned in the automatic performance pattern memorized by the automatic performance pattern storage means will be performed Corresponding to the hit drum pad concerned, an automatic performance pattern can be switched by hitting a drum pad so that it may become the blow pattern which is in agreement with the trigger pattern which corresponded for every drum pad.
[0012] Among this inventions, moreover, invention according to claim 3 The 1st setting means which sets the above-mentioned trigger pattern as the above-mentioned trigger pattern storage means corresponding to each of two or more above-mentioned drum pads in invention given in any 1 term of claim 1 or claim 2, respectively, It is made to have the 2nd setting means which sets the above-mentioned automatic performance pattern as the above-mentioned automatic performance pattern storage means corresponding to each of two or more above-mentioned drum pads, respectively.
[0013] Therefore, according to invention according to claim 3, corresponding to each of two or more drum pads, a trigger pattern can be set as a trigger pattern storage means with the 1st setting means among this inventions, respectively. Since an automatic performance pattern can be set as an automatic performance pattern storage means with the 2nd setting means corresponding to each of two or more drum pads, respectively A trigger pattern and an automatic performance pattern can be related with arbitration for every drum pad, and correlation with the trigger pattern for every drum pad and an automatic performance pattern can be further changed into arbitration.
[0014]
[Embodiment of the Invention] Hereafter, an example of the gestalt of operation of the electronic percussion instrument by this invention is explained to a detail, referring to an attached drawing.
[0015] In drawing 1 , the block block diagram of the electronic percussion instrument by this invention is shown, and this electronic percussion instrument is constituted so that control of actuation of that whole may be controlled using a central processing unit (CPU) 10.
[0016] The read only memory 14 the program for controlling actuation of CPU10 through a bus 12 in this CPU10 etc. was remembered to be (ROM), The random access memory 16 as working area where various register groups required for program execution etc. were set up (RAM), The control-panel section 20 equipped with the drop which displays the established state of the various handlers mentioned later and the various handlers concerned etc. and which is mentioned later, Four drum pads 22, 24, 26, and 28 which are equipped with the blow side and output the analog signal according to the blow to the blow side concerned, While changing into a digital signal the analog

signal outputted from four drum pads 22, 24, 26, and 28 and outputting to a bus 12 The analog-to-digital converter 30 which generates a pad interruput signal according to generating of the analog signal concerned (A/D), The timer 32 which outputs a timer interruput signal to CPU10 through a bus 12 to predetermined timing, The sound source 34 which generates and outputs a musical-sound signal based on processing of CPU10, The digital to analog converter 36 which changes and outputs the musical-sound signal slack digital signal outputted from the sound source 34 to an analog signal (D/A), It has the sound system 38 equipped with amplifier, a loudspeaker, etc. for carrying out sound emission of the musical-sound signal slack analog signal outputted from D/A36 to space as a musical sound, and is constituted.

[0017] In the control-panel section 20, as various handlers, in addition, the START/STOP (start/stop) carbon button 40, The EDIT (edit) carbon button 42 and the REC (recording) carbon button 44, The above cursor carbon button 52 for moving upward the cursor displayed on a display 18 (it mentions later), The down cursor carbon button 54 for moving the cursor concerned downward, The leftward cursor carbon button 56 for moving the cursor concerned leftward, the rightward cursor carbon button 58 for moving the cursor concerned rightward, and the data dial 60 are formed.

[0018] A setup based on actuation of these various handlers shall be read into CPU10, and shall be later mentioned about the function of various handlers.

[0019] Moreover, the drop 18 constituted by a liquid crystal display (LCD) etc., the drop 46 constituted by the light emitting diode (LED) which displays the actuation condition of the START/STOP carbon button 40, the drop 48 constituted by LED which displays the actuation condition of the EDIT carbon button 42, and the drop 50 constituted by LED which displays the actuation condition of the REC carbon button 44 are formed in the control-panel section 20 as various drops.

[0020] Moreover, a timer 32 shall output a timer interruput signal to 1/24 of the timing of a quarter note in the gestalt of this operation.

[0021] In order to make easy an understanding of the electronic percussion instrument by this invention here, suppose that four drum pads 22, 24, 26, and 28 are explained, and the trigger pattern and accompaniment pattern which are further related with these four drum pads 22, 24, 26, and 28 are explained first.

[0022] First, if drum pads 22, 24, 26, and 28 are explained, the blow side which a player hits by the stick, a foot pedal, etc. is established in drum pads 22, 24, 26, and 28, and the drum pad number from the drum pad number 1 to the drum pad number 4 is assigned to them, respectively.

[0023] And the musical sound of the percussion instrument pronounced when these four drum pads 22, 24, 26, and 28 are hit differs, as for the drum pad 26 of the drum pad number 3, the drum pad 22 of the drum pad number 1 pronounces the musical sound of cymbal by the drum pad 24 of the drum pad number 2 pronouncing the musical sound of a snare drum by pronouncing the musical sound of a kick drum, and the drum pad 28 of the drum pad number 4 pronounces the musical sound of a bass drum.

[0024] And when a player hits such four drum pads 22, 24, 26, and 28 using both-hands both guide pegs, the musical sound of the percussion instrument assigned to each drum pad 22, 24, 26, and 28 is pronounced, and a percussion instrument performance is performed.

[0025] The event which shows the percussion instrument performance according to the

blow of the drum pads 22, 24, 26, and 28 by such player here is stored in the pad buffer (padbuf) which is the predetermined memory area of RAM16 on real time, and the DS of a pad buffer is shown in drawing 2 .

[0026] 97 data areas of 11-bit (bit) length are established in the pad buffer, 96 data areas from a data area 1 to a data area 96 store the event of the above-mentioned percussion instrument performance in it, and a data area 97 stores "0" for distinguishing the last of data in it.

[0027] And it sets to the timer interrupt handler (it mentions later, referring to drawing 11 .) performed in this electronic percussion instrument for every timer interruput signal outputted to 1/24 of the timing of the quarter note by the timer 32. The performance which corresponds to 96 data areas from a data area 1 to a data area 96 at a part for one vibrant tune of the percussion instrument performance by the blow of a player's drum pads 22, 24, 26, and 28 (a "blow pattern" is called hereafter.) It is stored.

[0028] And as information for a comparison for comparing coincidence with the blow pattern stored in the pad buffer described above as the trigger pattern, it is stored in the predetermined memory area of RAM16, and an example of the data configuration of the memory area where the trigger pattern was stored is shown in drawing 3 .

[0029] As for the trigger pattern, the clock timing data of "127" for the clock timing data of 7 bit length for one vibrant tune to be put in order by the sequence at two or more:00, and distinguish the last of data in the last of a trigger pattern are stored.

[0030] As such a trigger pattern, they are the pattern name TP 1 and the pattern name TP 2... There is a trigger pattern of n different classes of the pattern name TPn ("n" is a positive integer), and the clock timing data of each trigger pattern are used as a score, and it is shown.

[0031] In addition, the case of "n= 4" is shown in the gestalt of this operation. For example, the clock timing data stored in the trigger pattern of the pattern name TP 1 show a total of four quarter notes which made the quarter note each ** in 4/4 rhythm. The clock timing data stored in the trigger pattern of the pattern name TP 2 show a total of eight eighth notes which made each ** in 4/4 rhythm two eighth notes. The clock timing data stored in the trigger pattern of the pattern name TP 3 show a total of four 3 ream marks which made each ** in 4/4 rhythm 3 ream mark. While the clock timing data stored in the trigger pattern of pattern name TP4 make the 3rd beat a quarter note with the 1st beat in 4/4 rhythm, a total of six notes which made the 4th beat two eighth notes with the 2nd beat are shown (refer to drawing 6 ).

[0032] furthermore, as an automatic performance pattern for making an automatic performance perform, it is stored in the predetermined memory area of R0M14, and the DS of the memory area where the accompaniment pattern was stored is indicated to be an accompaniment pattern to drawing 4 .

[0033] Each information on a pattern name, Il Tempo, a tone setup for every pronunciation channel, and an event is stored in the accompaniment pattern, among these an event is data about the performance sound which carries out an automatic performance, it consists of timing, a pitch, a pronunciation channel, and a velocity, and two or more events are put in order by time series in order of the performance.

[0034] As such an accompaniment pattern, they are the pattern name PP 1 and the pattern name PP 2... There is an accompaniment pattern of m different classes of the pattern name PPm ("m" is a positive integer).

[0035] The case of "m= 4" is shown in the gestalt of this operation. For example, the automatic performance of Locke Normal is performed according to the accompaniment pattern of the pattern name PP 1. The automatic performance of the Locke fill-in is performed according to the accompaniment pattern of the pattern name PP 2, the automatic performance of jazz Normal is performed according to the accompaniment pattern of the pattern name PP 3, and the automatic performance of a jazz fill-in is performed according to the accompaniment pattern of the pattern name PP 4.
[0036] In addition, since the processing performed by CPU10 at the time of performing an automatic performance according to an accompaniment pattern is already well-known, the detailed explanation is omitted.
[0037] And each of four drum pads 22, 24, 26, and 28 is related with any one accompaniment pattern in the accompaniment pattern of m different classes while it is related with any one trigger pattern in the trigger pattern of n different classes for every drum pad.
[0038] The DS of the variable group for every drum pad of the predetermined memory area of RAM16 which associates a trigger pattern and an accompaniment pattern for every drum pad is shown in drawing 5 , and it is shown to the injury concept target with relation of a drum pad, a trigger pattern, and an accompaniment pattern at drawing 6 .
[0039] In drawing 5 , PAD1 shows the drum pad 22 of the drum pad number 1, PAD2 shows the drum pad 24 of the drum pad number 2, PAD3 shows the drum pad 26 of the drum pad number 3, and PAD4 shows the drum pad 28 of the drum pad number 4.
[0040] Among [ trgptn1 (trigger pattern 1), trgptn2 (trigger pattern 2), and trgptn3 (trigger pattern 3) ] the variable groups for every drum pad, tregptn4 (trigger pattern 4) is a variable with which the start address of any one trigger pattern in the trigger pattern (refer to drawing 3 ) of n different classes is substituted, and initial value is TP1.
[0041] Moreover, among [ plyptn1 (accompaniment pattern 1), plyptn2 (accompaniment pattern 2), and plyptn3 (accompaniment pattern 3) ] the variable groups for every drum pad, plyptn4 (accompaniment pattern 4) is a variable with which the start address of one accompaniment pattern of either of the accompaniment patterns (refer to drawing 4 ) of m different classes is substituted, and initial value is PP1.
[0042] However, an accompaniment pattern is not changed when a start address is "0" (null point).
[0043] And by operating various handlers in this electronic percussion instrument, referring to the various drops of the control-panel section 20 beforehand In the example which it is made as [ set / the variable group for every above-mentioned drum pad ], and is shown in this drawing 5 thru/or drawing 6 About the drum pad 22 (PAD1) of the drum pad number 1 The start address of the trigger pattern of the pattern name TP 1 is set as a variable trgptn1 (trigger pattern 1). It is that by which the start address of the accompaniment pattern of the pattern name PP 1 is set as the variable plyptn1 (accompaniment pattern 1). About the drum pad 24 (PAD2) of the drum pad number 2 The start address of the trigger pattern of the pattern name TP 2 is set as a variable trgptn2 (trigger pattern 2). It is that by which the start address of the accompaniment pattern of the pattern name PP 2 is set as the variable plyptn2 (accompaniment pattern 2). About the drum pad 26 (PAD3) of the drum pad number 3 The start address of the trigger pattern of the pattern name TP 3 is set as a variable trgptn3 (trigger pattern 3). It is that by which the start address of the accompaniment pattern of the pattern name PP 3 is set as

the variable plyptn3 (accompaniment pattern 3). About the drum pad 28 (PAD4) of the drum pad number 4 The start address of the trigger pattern of pattern name TP4 is set as a variable trgptn4 (trigger pattern 4), and the start address of the accompaniment pattern of the pattern name PP 4 is set as the variable plyptn4 (accompaniment pattern 4).
[0044] In addition, detailed explanation of a setup of the variable group for every drum pad which was described above is given to mention later.
[0045] And the electronic percussion instrument by this invention associates the trigger pattern and the accompaniment pattern for every [ drum pads 22, 24, and 26 and ] 28, as described above. If one of drum pads is hit by the player and a percussion instrument performance is performed The blow pattern of the percussion instrument performance concerned will be stored in a pad buffer. Comparison processing with the blow pattern concerned and the trigger pattern set as the hit drum pad concerned is performed. When a blow pattern and the trigger pattern concerned concerned are in agreement as a result of the comparison processing concerned, an automatic performance is performed according to the accompaniment pattern set as the drum pad concerned.
[0046] That is, an automatic performance can be switched to the automatic performance according to the accompaniment pattern set up by the drum putt concerned at the midst which a player hits a drum pad and is doing the percussion instrument performance in the electronic percussion instrument by this invention by carrying out the percussion instrument performance of one of the drum pads so that it may become the blow pattern which is in agreement with the trigger pattern set as the drum pad concerned.
[0047] For example, when a percussion instrument performance is hit and carried out in the rhythm the trigger pattern of the pattern name TP 1 indicates the drum pad 22 of the drum pad number 1 to be, an automatic performance switches to the midst which a player hits a drum pad and is doing the percussion instrument performance in Locke Normal according to the accompaniment pattern of the pattern name PP 1.
[0048] padlnk1 (pad link 1), padlnk2 (pad link 2), padlnk3 (pad link 3), and padlnk4 (pad link 4) of the variable groups for every drum pad shown in above-mentioned drawing 5 here are a variable which shows the drum pad number of any one of four drum pads 22, 24, 26, and 28, and initial value is "0."
[0049] To however, the variable padlnk1 (pad link 1) of the drum pad 22 of the drum pad number 1 "1" which is the drum pad number of the drum pad 22 concerned cannot be set up. To the variable padlnk2 (pad link 2) of the drum pad 24 of the drum pad number 2 "2" which is the drum pad number of the drum pad 24 concerned cannot be set up. To the variable padlnk3 (pad link 3) of the drum pad 26 of the drum pad number 3 "3" which is the drum pad number of the drum pad 26 concerned cannot be set up, and "4" which is the drum pad number of the drum pad 28 concerned cannot set it as the variable padlnk4 (pad link 4) of the drum pad 28 of the drum pad number 4.
[0050] And when the drum pad number is set as this variable padlnk1 (pad link 1) thru/or variable padlnk4 (pad link 4), to refer to not only the drum pad hit by the player but the blow pattern by percussion instrument performance of the drum pad of the drum pad number set as the variable padlnk1 (pad link 1) thru/or the variable padlnk4 (pad link 4) will be made into the conditions of a switch of an accompaniment pattern.
[0051] In addition, suppose that the drum pad which had the drum pad number the drum pad which set up the variable padlnk1 (pad link 1) thru/or the variable padlnk4 (pad link 4) set as "the main drum pads", and a variable padlnk1 (pad link 1) thru/or a variable

padlnk4 (pad link 4) is suitably called "the drum pad of **" in this specification.
[0052] When "0" of initial value is set as the variable padlnk1 (pad link 1), here Although the automatic performance of Locke Normal of the accompaniment pattern of the pattern name PP 1 will be performed if a player hits and performs in the rhythm to which the trigger pattern of the pattern name TP 1 indicates that the drum pad 22 of the drum pad number 1 described above When "2" is set as the variable padlnk1 (pad link 1) The automatic performance of Locke Normal of the accompaniment pattern of the pattern name PP 1 is not performed only by a player hitting and performing the drum pad 22 of the drum pad number 1 in the rhythm which the trigger pattern of the pattern name TP 1 shows.
[0053] namely, when "2" is set as the variable padlnk1 (pad link 1) A player the drum pad 24 of the drum pad number 2 which is the drum pad of ** with the drum pad 22 of the drum pad number 1 which are the main drum pads By hitting and performing to coincidence in the rhythm which the trigger pattern of the pattern name TP 1 set as the main drum pads shows, the automatic performance of Locke Normal of the accompaniment pattern of the pattern name PP 1 will be performed.
[0054] and when "2" is set as the variable padlnk1 (pad link 1) A player the drum pad 24 of the drum pad number 2 which is the drum pad of ** with the drum pad 22 of the drum pad number 1 which are the main drum pads Even if it hits and performs to coincidence in the rhythm which the trigger pattern of the pattern name TP 2 set as the drum pad of ** shows, the automatic performance of Locke Normal of the accompaniment pattern of the pattern name PP 1 is not performed.
[0055] Thus, what "a percussion instrument performance which serves as a blow pattern which is in agreement with the trigger pattern set as the main drum pads by coincidence in two or more drum pads of the main drum pads and the drum pad of ** is performed for" will be made into the conditions of a switch of an accompaniment pattern by setting a drum pad number as a variable padlnk1 (pad link 1) thru/or a variable padlnk4 (pad link 4).
[0056] Next, various register groups as shown in drawing 7 other than a memory area which stores a trigger pattern and an accompaniment pattern which were described above, and a variable group are set to RAM16, and there are some which are shown below as a register relevant to operation of this invention. In addition, in the following explanation, especially the contents (data etc.) of each register shall be expressed with the same label name, unless it refuses.
[0057] (1) Status register (statusreg)
This register is a register to show the current operating state of the electronic percussion instrument by this invention, and has five, a halt (STOP) condition, a performance initiation (START) condition, an edit (EDIT) condition, a sound recording preparation (RECSTBY) condition, and a sound recording (REC) condition, as operating state.
[0058] A idle state is in the condition that the automatic performance is not performed according to the accompaniment pattern, and is in the condition in initial setting.
[0059] A performance initiation condition is in the condition that the automatic performance is performed according to the accompaniment pattern, and can switch an accompaniment pattern by hitting drum pads 22, 24, 26, and 28 in this condition.
[0060] An edit condition is in the condition at the time of operating various handlers and setting up drum pads 22, 24, and 26 and the variable group (referring to drawing 5 ) in

every 28, referring to the various drops of the control-panel section 20.
[0061] In addition, about the detail of setting actuation of the variable group in an edit condition, it shall mention later.
[0062] A sound recording preparatory state is in the condition at the time of performing selection of the trigger pattern address at the time of hitting drum pads 22, 24, 26, and 28, and carrying out the real-time record of the trigger pattern which carries out a record, selection of the drum pads 22, 24, 26, and 28 for a trigger pattern input, etc.
[0063] And a sound recording condition is in the condition at the time of hitting drum pads 22, 24, 26, and 28, and carrying out the real-time record of the trigger pattern.
[0064] In addition, the detailed explanation about the real-time record of a trigger pattern shall be mentioned later.
[0065] (2) Pad buffer pointer (padbufptr)
A pad buffer pointer is a pointer register which substitutes the address of 96 data areas of the pad buffer (refer to drawing 2 ) with which the blow pattern corresponding to a part for one vibrant tune of the percussion instrument performance by the blow of the above-mentioned drum pads 22, 24, 26, and 28 is stored, and initial value is the start address of the data area 1 of a pad buffer.
[0066] In case the event of a blow pattern is read from writing in a pad buffer ****, or a pad buffer, the data area of the address which the register padbufptr of the data areas of a pad buffer (pad buffer pointer) shows is referred to.
[0067] (3) Trigger pattern pointer 1 (trgptnptr1)
Those with a pointer register and initial value for which the start address of the trigger pattern (namely, trigger pattern set as the variable trgptn1 (trigger pattern 1)) with which this register was set as the drum pad 22 of the drum pad number 1 among the trigger patterns (R> drawing 3 3 reference) of n different classes (it is "n= 4" in the gestalt of this operation.) is substituted are 0 (null pointer).
[0068] Comparison processing with the trigger pattern of a start address which this register points out, and the blow pattern stored in the pad buffer by the blow of the drum pad 22 of the drum pad number 1 is performed.
[0069] (4) Trigger pattern pointer 2 (trgptnptr2)
Those with a pointer register and initial value for which the start address of the trigger pattern (namely, trigger pattern set as the variable trgptn2 (trigger pattern 2)) with which this register was set as the drum pad 24 of the drum pad number 2 among the trigger patterns (R> drawing 3 3 reference) of n different classes (it is "n= 4" in the gestalt of this operation.) is substituted are 0 (null pointer).
[0070] Comparison processing with the trigger pattern of a start address which this register points out, and the blow pattern stored in the pad buffer by the blow of the drum pad 24 of the drum pad number 2 is performed.
[0071] (5) Trigger pattern pointer 3 (trgptnptr3)
Those with a pointer register and initial value for which the start address of the trigger pattern (namely, trigger pattern set as the variable trgptn3 (trigger pattern 3)) with which this register was set as the drum pad 26 of the drum pad number 3 among the trigger patterns (R> drawing 3 3 reference) of n different classes (it is "n= 4" in the gestalt of this operation.) is substituted are 0 (null pointer).
[0072] Comparison processing with the trigger pattern of a start address which this register points out, and the blow pattern stored in the pad buffer by the blow of the drum

pad 26 of the drum pad number 3 is performed.
[0073] (6) Trigger pattern pointer 4 (trgptnptr4)
Those with a pointer register and initial value for which the start address of the trigger pattern (namely, trigger pattern set as the variable trgptn4 (trigger pattern 4)) with which this register was set as the drum pad 28 of the drum pad number 4 among the trigger patterns (R> drawing 3 3 reference) of n different classes (it is "n= 4" in the gestalt of this operation.) is substituted are 0 (null pointer).
[0074] Comparison processing with the trigger pattern of a start address which this register points out, and the blow pattern stored in the pad buffer by the blow of the drum pad 28 of the drum pad number 4 is performed.
[0075] (7) Accompaniment pattern pointer (plyptnptr)
This register is m pieces (in the gestalt of this operation). it is "m= 4." Comparison processing with a blow pattern and the trigger pattern set as the hit drum pad is performed among the accompaniment patterns (refer to drawing 4 ) of a different class. When a blow pattern and the trigger pattern concerned concerned are in agreement as a result of the comparison processing concerned The accompaniment pattern set as the hit drum pad concerned It is the pointer register with which the start address of (the accompaniment pattern [ namely, ] set to either the variable plyptn1 (accompaniment pattern 1) thru/or the variable plyptn4 (accompaniment pattern 4)) is substituted, and initial value is the pattern name PP 1.
[0076] An automatic performance is switched according to the accompaniment pattern of a start address which this register points out.
[0077] (8) Trigger coincidence (trgmuch)
This register is a register in which the drum pad number of the hit drum pad concerned is shown, when comparison processing with a blow pattern and the trigger pattern set as the hit drum pad is performed and a blow pattern and the trigger pattern concerned concerned are in agreement as a result of the comparison processing concerned.
[0078] A value when the blow pattern and the trigger pattern are not in agreement is "0", and initial value is also set as "0."
[0079] (6) Clock (clk)
This register is a register in which basic clock timing is shown, the case where an automatic performance is performed according to an accompaniment pattern, when carrying out comparison processing of a blow pattern and the trigger pattern, or when detecting the blow pattern by the blow of the drum pads 22, 24, 26, and 28 by the player on real time, and initial value is "1."
[0080] (7) Pad register (padreg)
This register is a register which remembers temporarily the timing by which the drum pad concerned was hit to be the number of the drum pad hit by the player, and the data format of Register padreg (pad register) is shown in drawing 8 .
[0081] Register padreg (pad register) has die length of 11 bits, and the bit number to "10" is given one by one, using the least significant bit as "0."
[0082] The bit number 0 corresponds to a drum pad 22 (PAD1), the bit number 1 corresponds to a drum pad 24 (PAD2), 4 bits of low order from the bit number 0 to the bit number 3 correspond to each of four drum pads 22, 24, 26, and 28, and the bit number 3 corresponds [ the bit number 2 corresponds to a drum pad 26 (PAD3), and ] to a drum pad 28 (PAD4).

[0083] The initial value of 4 bits of these low order is "0", and "1" will be substituted for the bit corresponding to the hit drum pad if a drum pad is hit.
[0084] The timing clock data in which the timing by which drum pads 22, 24, 26, and 28 were hit is shown are stored in 7 bits of high orders from the bit number 4 to the bit number 10.
[0085] And the data which that of a data format of this register padreg (pad register) are the same as that of a data format of one of 96 data areas from the data area 1 of the above-mentioned pad buffer to a data area 96, and were temporarily memorized by Register padreg (pad register) will be behind stored in a pad buffer.
[0086] Here, the component of others which constitute the above-mentioned electronic percussion instrument shall be further explained to a detail.
[0087] The program for CPU10 to perform processing shown in the flow chart which a program, a parameter, etc. for performing initial setting of this electronic percussion instrument etc. in ROM14 other than the above-mentioned accompaniment pattern are memorized, and is mentioned later, the program for CPU10 to perform various kinds of processings irrelevant to operation of this invention, etc. are memorized.
[0088] The drop 18 set as the control-panel section 20 is constituted by the liquid crystal display (LCD), he is trying to be displayed in an actuation condition, an acknowledgement message, etc. of various handlers, and a player can check the established state of this electronic percussion instrument by referring to a drop 18.
[0089] Next, suppose that the function of the various handlers prepared in the control-panel section 20 is explained.
[0090] The START/STOP carbon button 40, the EDIT carbon button 42, and the REC carbon button 44 are handlers which set up the operating state of this electronic percussion instrument, and if these START/STOP carbon button 40, the EDIT carbon button 42, and the REC carbon button 44 are operated, while the operating state of an electronic percussion instrument will be set up according to that actuation, according to that actuation, a setup of the register statusreg of RAM16 (status register) in which current operating state is shown is changed.
[0091] Namely, if the START/STOP carbon button 40 is turned on when a setup of Register statusreg (status register) is a idle state, while it will change the operating state of an electronic percussion instrument into a performance initiation condition from a idle state If a setup of Register statusreg (status register) is changed into a performance initiation condition from a idle state, and it is turned on when a setup of Register statusreg (status register) is in a performance initiation condition While changing the operating state of an electronic percussion instrument into a idle state from a performance initiation condition, a setup of Register statusreg (status register) is changed into a idle state from a performance initiation condition.
[0092] Furthermore, the START/STOP carbon button 40 If it is turned on when a setup of Register statusreg (status register) is a sound recording preparatory state, while changing the operating state of an electronic percussion instrument into a sound recording condition from a sound recording preparatory state If a setup of Register statusreg (status register) is changed into a sound recording condition from a sound recording preparatory state, and it is turned on when a setup of Register statusreg (status register) is in a sound recording condition While changing the operating state of an electronic percussion instrument into a idle state from a sound recording condition, a setup of Register

statusreg (status register) is changed into a idle state from a sound recording condition.
[0093] However, while it is disregarded even if the START/STOP carbon button 40 is turned on, when a setup of Register statusreg (status register) is in an edit condition, and not making a change of the operating state of an electronic percussion instrument, a change of a setup of Register statusreg (status register) is not made.
[0094] If the EDIT carbon button 42 is turned on when a setup of Register statusreg (status register) is a idle state, while it will change the operating state of an electronic percussion instrument into an edit condition from a idle state If a setup of Register statusreg (status register) is changed into an edit condition from a idle state, and it is turned on when a setup of Register statusreg (status register) is in an edit condition While changing the operating state of an electronic percussion instrument into a idle state from an edit condition, a setup of Register statusreg (status register) is changed into a idle state from an edit condition.
[0095] However, while the EDIT carbon button 42 is disregarded even if a setup of Register statusreg (status register) is turned on in a performance initiation condition, a sound recording preparatory state, and a sound recording condition, and not making a change of the operating state of an electronic percussion instrument, a change of a setup of Register statusreg (status register) is not made.
[0096] If the REC carbon button 44 is turned on when a setup of Register statusreg (status register) is a idle state, while it will change the operating state of an electronic percussion instrument into a sound recording condition from a idle state If a setup of Register statusreg (status register) is changed into a sound recording preparatory state from a idle state, and it is turned on when a setup of Register statusreg (status register) is a sound recording preparatory state While changing the operating state of an electronic percussion instrument into a idle state from a sound recording preparatory state, a setup of Register statusreg (status register) is changed into a idle state from a sound recording preparatory state.
[0097] However, while the REC carbon button 44 is disregarded even if a setup of Register statusreg (status register) is turned on in a performance initiation condition, an edit condition, and a sound recording condition, and not making a change of the operating state of an electronic percussion instrument, a change of a setup of Register statusreg (status register) is not made.
[0098] Three drops 46, 48, and 50 are things therefore constituted, such as light emitting diode (LED). An indicator 46 corresponds to the START/STOP carbon button 40, and an indicator 48 corresponds to the EDIT carbon button 42. The indicator 50 supports the REC carbon button 44, and it responds to modification of a setup of the register statusreg by the START/STOP carbon button 40, the EDIT carbon button 42, and the REC carbon button 44 (status register). Drops 46, 48, and 50 repeat lighting/putting out lights.
[0099] That is, an indicator 46 turns on an indicator 48, when a setup of Register statusreg (status register) is in an edit condition, when it is in the time of a setup of Register statusreg (status register) being in a performance initiation condition, and a sound recording condition, the light is switched on, when it is in the time of Register statusreg (status register) being a sound recording preparatory state, and a sound recording condition, it turns on an indicator 50, and in other than the above, it switches off any indicator.
[0100] Four four-directions cursor carbon buttons 52, 54, 56, and 58 and the data dial 60

When a setup of Register statusreg (status register) is in an edit condition The variable trgptn1 (trigger pattern 1) thru/or variable trgptn4 (trigger pattern 4) which is a variable group for every drum pad, It faces setting up a variable plyptn1 (accompaniment pattern 1) thru/or a variable plyptn4 (accompaniment pattern 4) and a variable padlnk1 (pad link 1) thru/or a variable padlnk4 (pad link 4). The parameter and value of the request of the parameters and values which are displayed on a drop 18 are specified.

[0101] In the above configuration, while referring to the flow chart which shows an operation and actuation of this electronic percussion instrument to drawing 9 thru/or drawing 12 , it shall explain.

[0102] In the main routine shown in drawing 9 , setting processing of various kinds of initialization processes, setting processing of the register according to actuation of various handlers, lighting/putting-out-lights processing of indicators 46, 48, and 50, four four-directions cursor carbon buttons 52, 54, 56, and 58, and the variable group by the data dial 60 etc. is performed.

[0103] That is, if a power source is supplied to the electronic percussion instrument by this invention, a main routine will be started and the value of various registers or various variables will be first set as each initial value in step S902.

[0104] After various kinds of initialization processes are completed in step S902, it progresses to step S904 and panel processing is performed. Processing which displays a parameter and a value on a drop 18, detects the actuation condition of various handlers, carries out the set or reset of the register according to actuation of various handlers, or specifically turns on / switches off drops 46, 48, and 50 is performed.

[0105] After ending panel processing of step S904, it progresses to step S906 and edit processing is performed. When a setup of Register statusreg (status register) is in an edit condition, the screen top of a drop 18 serves as an edit display, a desired variable is chosen with four four-directions cursor carbon buttons 52, 54, 56, and 58 out of the variable group (refer to drawing 5 ) for every displayed drum pad, by the data dial 60, the value of a variable is specified and, specifically, the variable group for every drum putt is set up.

[0106] That is, a trigger pattern and an accompaniment pattern are associated for every drum putt, and a setup of a variable padlnk1 (pad link 1) thru/or a variable padlnk4 (pad link 4) is performed further.

[0107] In the gestalt of this operation however, about a variable padlnk1 (pad link 1) thru/or a variable padlnk4 (pad link 4) In order to make an understanding easy, initial value "0" shall be set up. The conditions of a switch of what "a percussion instrument performance which serves as a blow pattern which is in agreement with the trigger pattern set as the main drum pads by coincidence in two or more drum pads of the main drum pads and the drum pad of ** is performed for" of an accompaniment pattern have not been carried out.

[0108] In addition, in step S906, when Register statusreg (status register) is except an edit condition, edit processing is not performed but it progresses to step S908.

[0109] In step S908, others, such as a real-time record of the above-mentioned trigger pattern, are processed, and it returns to step S904 which is the start point of loop-formation processing of a main routine.

[0110] Here, if the real-time record of a trigger pattern is explained, when a setup of Register statusreg (status register) is a idle state, first, the REC carbon button 44 is turned

on, a setup of Register statusreg (status register) will be changed into a sound recording preparatory state, and selection of the trigger pattern address which carries out a record, selection of the drum pad for a trigger pattern input, etc. will be performed using the various handlers and drop 18 of the control-panel section 20.
[0111] And the START/STOP carbon button 40 is turned on, a setup of Register statusreg (status register) is changed into a sound recording condition, the drum pad chosen as an object for a trigger pattern input is hit, and the real-time record of the trigger pattern is carried out.
[0112] Thus, a player can do the real-time record of the desired trigger pattern, and can store the trigger pattern of n different classes in the predetermined memory area of RAM16 beforehand.
[0113] Moreover, when a player hits one of drum pads in a main routine, whenever it hits, a pad interruput signal will be outputted to CPU10 through a bus 12 from A/D converter 30, and the pad interrupt handler shown in drawing 10 will be performed.
[0114] That is, although the main routine is usually repeated at high speed, if a pad interruput signal is supplied to CPU10 as it described above, CPU10 will start and perform a pad interrupt handler, and after activation of a pad interrupt handler will continue repeating a main routine again.
[0115] That is, in a pad interrupt handler, pronunciation processing of the musical sound of the percussion instrument according to the drum pad hit by the player and processing which sets the bit of the register padreg corresponding to the hit drum pad concerned (pad register) as "1" are performed.
[0116] If a pad interrupt handler is started, in step S1002, pronunciation processing of the musical sound of the percussion instrument according to the drum pad hit by the player will be performed first, and the musical sound of the percussion instrument of the hit drum pad concerned will be pronounced.
[0117] After ending step S1002, it progresses to step S1004, and processing which makes a setup the bit of the register padreg corresponding to the hit drum pad concerned (pad register) "1" is performed.
[0118] For example, when the drum pad 22 of the drum pad number 1 is hit, "1" is set as the bit of the bit number 0 of the register padreg corresponding to a drum pad 22 (pad register).
[0119] And after ending step S1004, this pad interrupt handler is ended and a return is carried out to a main routine.
[0120] Moreover, when the timer interruput signal outputted to 1/24 of the timing of a quarter note by the timer 32 in a main routine is outputted to CPU10 through a bus 12, the timer interrupt handler shown in drawing 11 will be performed.
[0121] That is, although the main routine is usually repeated at high speed, if a timer interruput signal is supplied to CPU10 as it described above, CPU10 will start and perform a timer interrupt handler, and after activation of a timer interrupt handler will continue repeating a main routine again.
[0122] In a timer interrupt handler, storing processing of the event of the blow pattern by the blow of a player's drum pad, automatic performance processing in which the accompaniment pattern was followed, comparison processing, with a blow pattern and a trigger pattern, switch processing of an accompaniment pattern, etc. are performed.
[0123] That is, if a timer interrupt handler is started, it will be judged by the established

state of Register statusreg (status register) whether it is the midst to which the automatic performance according to an accompaniment pattern is first performed in step S1102.
[0124] In decision processing of this step S1102, when a setup of Register statusreg (status register) is judged to be in a performance initiation condition, it is the midst to which the automatic performance according to an accompaniment pattern is performed, and progresses to processing of step S1104.
[0125] Since it is not the midst to which the automatic performance according to an accompaniment pattern is performed on the other hand when a setup of Register statusreg (status register) is judged to be in conditions other than a performance initiation condition in decision processing of this step S1102, a timer interrupt handler is ended as it is, and a return is carried out to a main routine.
[0126] And in step S1104, it is judged by whether data are in Register padreg (pad register) whether one of drum putt is hit by the player.
[0127] In decision processing of this step S1104, when it is judged that data are in Register padreg (pad register) (i.e., when "1" is set as one bit of 4 bits of the low order from the bit number 0 of Register padreg (pad register) to the bit number 3), one of drum pads is hit by the player and it progresses to processing of step S1106.
[0128] When it is judged in decision processing of this step S1104 on the other hand that there are no data in Register padreg (pad register) (i.e., when "0" is set as all the bits of 4 bits of low order from the bit number 0 of Register padreg (pad register) to the bit number 3), by the player, neither of the drum pads is hit, but it jumps to processing of step S1110, and progresses to it.
[0129] In step S1106, the timing clock data in which the timing to which the drum pad was hit by the player is shown are stored in 7 bits of high orders from the bit number 4 of Register padreg (pad register) to the bit number 10.
[0130] Here, the information corresponding to the drum pad already hit in step S1104 about 4 bits of low order of Register padreg (pad register) is stored, it writes in the data area of the pad buffer which Register padbufptr (pad buffer pointer) shows the data of the register padreg (pad register) which is such 11 bits, and storing processing of the event of the blow pattern by the player is performed.
[0131] Since the blow of the next drum pad of a blow of the drum pad which progressed to processing of step S1108 and was stored in the pad buffer in step S1106 is stored after ending processing of step S1106 One data area of the pad buffer with which "1" increment of the value of Register padbufptr (pad buffer pointer) is carried out, and the data of Register padreg (pad register) are written in is advanced. Moreover, the value of the register padreg (pad register) with which the data stored in the pad buffer already remain in step S1106 is cleared. After ending processing of such a step S1108, it progresses to processing of step S1110.
[0132] And in processing of step S1110, since it is judged that it is the midst of an automatic performance in step S1102, the musical sound based on the event of the accompaniment pattern of the automatic performance concerned is reproduced.
[0133] That is, in step S1110, if the event corresponding to the timing of the register clk (clock) of this time (current) is in the event of the accompaniment pattern by which current selection is made, the musical sound based on the event concerned will be reproduced.
[0134] After ending processing of step S1110, it progresses to processing of step S1112,

and "1" increment of the value of Register clk (clock) is carried out, and it progresses to step S1114.
[0135] And in step S1114, it is judged by whether the value of Register clk (clock) reached "96" whether it is the timing of the last of one vibrant tune.
[0136] In decision processing of this step S1114, when the value of Register clk (clock) is judged to have reached "96" (i.e., when it is judged that it is the timing of the last of one vibrant tune), it progresses to processing of step S1116.
[0137] When the value of Register clk (clock) is judged to have not reached "96" in decision processing of this step S1114 on the other hand (i.e., when it is judged that it is not the timing of the last of one vibrant tune), this pad interrupt handler is ended and a return is carried out to a main routine.
[0138] And in step S1116, comparison processing with a blow pattern and a trigger pattern is performed (refer to drawing 12 ).
[0139] In addition, about the detail of this comparison processing, it mentions later, referring to the flow chart shown in drawing 1212 .
[0140] After ending processing of step S1116, it progresses to processing of step S1118 here. The value of the register trgmuch (trigger coincidence) obtained by comparison processing with the blow pattern of step S1116 and a trigger pattern is used. The start address of the accompaniment pattern set to either the variable plyptn1 (accompaniment pattern 1) set as the drum pad of the drum pad number which the value of the register trgmuch concerned (trigger coincidence) shows or thru/or the variables plyptn4 (accompaniment pattern 4) It substitutes for Register plyptnptr (accompaniment pattern pointer) (step S1118).
[0141] Consequently, the accompaniment pattern under automatic performance concerned will be switched to the midst to which the automatic performance is performed according to one of accompaniment patterns by the accompaniment pattern which Register plyptnptr (accompaniment pattern pointer) shows.
[0142] And after ending processing of step S1118, it progresses to processing of step S1120, the start address of the data area 1 of the pad buffer which is initial value is substituted and initialized to Register padbufptr (pad buffer pointer) for comparison processing with the following blow pattern and a trigger pattern, the value of Register padreg (pad register) is cleared, and "0" is substituted for Register clk (clock).
[0143] After ending processing of step S1120, this pad interrupt handler is ended and a return is carried out to a main routine.
[0144] Next, in the comparison manipulation routine of the blow pattern and trigger pattern which are shown in drawing 12 , when processing which compares a blow pattern with a trigger pattern for every drum pad is performed and the blow pattern and the trigger pattern are in agreement as a result of the comparison processing concerned, processing which substitutes for Register trgmuch (trigger coincidence) the drum pad number of the drum pad the blow pattern and whose trigger pattern corresponded is performed.
[0145] Furthermore, when the above-mentioned thing "for which a percussion instrument performance which serves as a blow pattern which is in agreement with the trigger pattern set as the main drum pads by coincidence in two or more drum pads of the main drum pads and the drum pad of ** is performed" is made into the conditions of a switch of an accompaniment pattern, comparison processing is performed in two or more blow

patterns and trigger patterns in a drum pad.
[0146] First, in step S1202, the value which Register padbufptr (pad buffer pointer) shows in whether one of drum pads is hit by the player is judged by whether it is "0."
[0147] In addition, in the initialization process of step S902, Register padbufptr (pad buffer pointer) substitutes the start address of the data area 1 of the pad buffer which is initial value, and is initialized.
[0148] In processing of this step S1202, when the value which Register padbufptr (pad buffer pointer) shows is judged not to be "0", data are stored in the pad buffer, one of drum pads is hit, and it progresses to step S1204 in this case.
[0149] On the other hand, when it is judged that the value which Register padbufptr (pad buffer pointer) shows is "0" in processing of this step S1202, neither of the drum pads is hit, and in this case, it jumps to step S1220 and progresses to it.
[0150] In step S1204, the start address of the variable trgptn1 (trigger pattern 1) set up for every drum pad in step S906 as preparation of the processing which compares a blow pattern with a trigger pattern thru/or a variable trgptn4 (trigger pattern 4) is substituted for the register trgptnptr1 (trigger pattern pointer 1) thru/or register trgptnptr4 (trigger pattern pointer 4) which corresponded for every drum pad.
[0151] The start address of the trigger pattern set as the variable trgptn1 (trigger pattern 1) of the drum pad 22 of the drum pad number 1 specifically It substitutes for a register trgptnpr1 (trigger pattern pointer 1). The start address of the trigger pattern set as the variable trgptn2 (trigger pattern 2) of the drum pad 24 of the drum pad number 2 It substitutes for a register trgptnpr2 (trigger pattern pointer 2). The start address of the trigger pattern set as the variable trgptn3 (trigger pattern 3) of the drum pad 26 of the drum pad number 3 It substitutes for a register trgptnpr3 (trigger pattern pointer 3). The start address of the trigger pattern set as the variable trgptn4 (trigger pattern 4) of the drum pad 28 of the drum pad number 4 is substituted for a register trgptnpr4 (trigger pattern pointer 4).
[0152] After ending processing of step S1204, it progresses to processing of step S1206, and judges whether the timing of a blow pattern and the timing of a trigger pattern are in agreement, or the clock timing data of a pad buffer and the clock timing data of a trigger pattern are in agreement by referring to 7 bits of high orders of a pad buffer.
[0153] Under the present circumstances, the trigger pattern which a trigger pattern to the trigger pattern of a variable trgptn4 (trigger pattern 4) of a variable trgptn1 (trigger pattern 1) carries out the sequential comparison of the 7 bits of the high orders of the clock timing data of a pad buffer, and is in agreement is detected.
[0154] And in decision of step S1206, when it is judged that the clock timing data of a blow pattern and the clock timing data of a trigger pattern are in agreement, it progresses to step S1208.
[0155] On the other hand, when it is judged in decision of step S1206 that the clock timing data of a blow pattern and the clock timing data of a trigger pattern are not in agreement, it jumps to step S1220 and progresses to it.
[0156] In step S1208, it is judged by 4 bits of low order of a pad buffer whether the drum pad with which the trigger pattern which was in agreement with the blow pattern is set up is in agreement with the drum pad hit by the player.
[0157] That is, when "1" is set as the bit corresponding to the drum pad with which the trigger pattern which was in agreement with the blow pattern among 4 bits of low order is

set up, the drum pad with which the trigger pattern which was in agreement with the blow pattern is set up, and the drum pad hit by the player are in agreement, and it progresses to step S1210 in this case.
[0158] When "1" is not set as the bit corresponding to the drum pad with which the trigger pattern which was in agreement with the blow pattern among 4 bits of low order is set up on the other hand, the drum pad with which the trigger pattern which was in agreement with the blow pattern is set up, and the drum pad hit by the player are not in agreement, and it progresses to step S1220 in this case.
[0159] In this way, in step S1206 and step S1208, when it is judged whether the blow pattern of the hit drum pad is in agreement with the trigger pattern set as the hit drum pad concerned and it is in agreement, after ending step S1208, it progresses to step S1210.
[0160] And in step S1210, it is judged by setup of a variable padlnk1 (pad link 1) thru/or a variable padlnk4 (pad link 4) whether what "a percussion instrument performance which serves as a blow pattern which is in agreement with the trigger pattern set as the main drum pads by coincidence in two or more drum pads of the main drum pads and the drum pad of ** is performed for" is made into the conditions of a switch of an accompaniment pattern.
[0161] When it is judged in decision processing of this step S1210 that the drum pad number is set as a variable padlnk1 (pad link 1) thru/or a variable padlnk4 (pad link 4) What "a percussion instrument performance which serves as a blow pattern which is in agreement with the trigger pattern set as the main drum pads by coincidence in two or more drum pads of the main drum pads and the drum pad of ** is performed for" is made into the conditions of a switch of an accompaniment pattern. In order to process this condition, it progresses to step S1212.
[0162] On the other hand, when it is judged in decision processing of step S1210 that the drum pad number is not set as a variable padlnk1 (pad link 1) thru/or a variable padlnk4 (pad link 4) Since what "a percussion instrument performance which serves as a blow pattern which is in agreement with the trigger pattern set as the main drum pads by coincidence in two or more drum pads of the main drum pads and the drum pad of ** is performed for" is not made into the conditions of a switch of an accompaniment pattern, It progresses to step S1214 then.
[0163] In addition, although it will progress to step S1214 since "0" is altogether set to the variable padlnk1 (pad link 1) thru/or the variable padlnk4 (pad link 4) in step S906 in the gestalt of this operation as described above For example, when "2" is set as the variable padlnk1 (pad link 1) in step S906, it progresses to step S1212.
[0164] In step S1212, it is judged by 4 bits of low order of a pad buffer whether the drum pad with which the drum pad number was set as the variable padlnk1 (pad link 1) thru/or the variable padlnk4 (pad link 4) is hit by coincidence.
[0165] In decision processing of this step S1212 When it is judged that "1" is set as the bit corresponding to the drum pad with which the drum pad number was set as the variable padlnk1 (pad link 1) thru/or the variable padlnk4 (pad link 4) among 4 bits of low order Two or more drum pads of the main drum pads and the drum pad of ** are hit by coincidence, and progress to step S1214 in this case.
[0166] On the other hand, it sets to decision processing of step S1212. When it is judged that "1" is not set as the bit corresponding to the drum pad with which the drum pad number was set as the variable padlnk1 (pad link 1) thru/or the variable padlnk4 (pad link

4) among 4 bits of low order Two or more drum pads of the main drum pads and the drum pad of ** are not hit by coincidence, and progress to step S1220 in this case.
[0167] In step S1214, as preparation of comparison processing of the following data, "1" increment of the value of Register padbufptr (pad buffer pointer) and the value of a trigger pattern pointer is carried out, and it progresses to step S1216.
[0168] And in step S1216, it is judged by whether whether all the blow patterns of the no which referred to all the blow patterns, i.e., a pad buffer, were read is "0" from which the value of the read pad buffer distinguishes the last of data.
[0169] In decision processing of step S1216, when the value of a pad buffer is judged to be "0", all the blow patterns will be referred to and it progresses to step S1218 in this case.
[0170] On the other hand, when the value of a pad buffer is judged not to be "0" in decision processing of step S1216, all the blow patterns will be referred to and it processes by returning to step S1206 in this case.
[0171] And in step S1218, it is judged by whether whether all the trigger patterns were referred to is "127" the value of the clock timing data of the read trigger pattern indicates the last of data to be.
[0172] In decision processing of step S1218, when the value of clock timing data is judged to be "127", all the trigger patterns will be referred to and it progresses to step S1222 in this case.
[0173] On the other hand, when the value of clock timing data is judged not to be "127" in decision processing of step S1218, all the trigger patterns will be referred to and it progresses to step S1220 in this case.
[0174] "0" is substituted for Register trgmuch (trigger coincidence) in step S1220. And the comparison manipulation routine of this blow pattern and a trigger pattern is ended, and a return is carried out to a timer interrupt handler.
[0175] Moreover, in step S1222, the drum pad number of the drum pad the blow pattern and whose trigger pattern corresponded with Register trgmuch (trigger coincidence) is substituted, and the comparison manipulation routine of this blow pattern and a trigger pattern is ended, and a return is carried out to a timer interrupt handler.
[0176] In this way, after ending the comparison manipulation routine of a blow pattern and a trigger pattern, switch processing of the accompaniment pattern according to the value of Register trgmuch (trigger coincidence) will be performed in step S1118.
[0177] As it described above, in a main routine and a pad interrupt handler, a trigger pattern and an accompaniment pattern are associated for every drum pad. A blow pattern is stored in a timer interrupt handler, and comparison processing with a blow pattern and the trigger pattern concerned concerned is performed in a comparison manipulation routine. When a blow pattern and the trigger pattern concerned concerned are in agreement as a result of the comparison processing, an automatic performance is performed according to the accompaniment pattern whose blow pattern and trigger pattern concerned concerned corresponded and which was associated for every drum pad.
[0178] In addition, you may make it give the information that the drum pad was hit, through the means of communications by MIDI etc. in the above-mentioned gestalt of operation, although a player shall actually hit by the stick, a foot pedal, etc. about the blow of a drum pad, without being restricted to this.
[0179] Moreover, in the above-mentioned gestalt of operation, although four drum pads

were arranged Without being restricted to this, one drum pad is sufficient and, of course, you may make it arrange two or more three drum pads [ five or more ] again two. In that case The data configuration (R> drawing 5 5 reference) and the various registers (refer to drawing 7 ) for every drum pad of a variable group of RAM shall be set up according to the number of a drum pad. [ of a memory area ]

[0180] Moreover, without being restricted to this, it records the trigger pattern on record means, such as a hard disk, beforehand, and you may make it use this trigger pattern memorized beforehand in the above-mentioned gestalt of operation, although the real-time record of the trigger pattern shall be carried out in step S908.

[0181] Moreover, in the above-mentioned gestalt of operation, although a trigger pattern shall show a score as shown in drawing 6 , the trigger pattern associated for every drum pad and an accompaniment pattern may be set as the corresponding thing, without being restricted to this. For example, when the automatic performance according to an accompaniment pattern serves as Locke Normal, the trigger pattern which harmonizes with an automatic performance of the accompaniment pattern by the Locke Normal concerned is set up.

[0182] thus -- if it carries out -- an accompaniment pattern -- Locke Normal -- a switch -- since a player performs a percussion instrument performance which serves as a blow pattern which is in agreement with the trigger pattern which harmonizes with the accompaniment pattern by Locke Normal when like, harmony with a percussion instrument performance and an automatic performance is born, and it is much more effective.

[0183] Moreover, in the above-mentioned gestalt of operation, in case a trigger pattern and an accompaniment pattern are associated for every drum pad, as shown in drawing 6 The trigger pattern of the trigger pattern name TP 1 and the accompaniment pattern of the pattern name PP 1 are related with a drum pad 22. The trigger pattern of the trigger pattern name TP 2 and the accompaniment pattern of the pattern name PP 2 are related with a drum pad 24. Although the trigger pattern of the trigger pattern name TP 3 and the accompaniment pattern of the pattern name PP 3 were related with the drum pad 26 and the trigger pattern of trigger pattern name TP4 and the accompaniment pattern of the pattern name PP 4 were related with the drum pad 28 Of course [ without being restricted to this ], you may make it change the combination of the trigger pattern for every drum pad, and an accompaniment pattern. For example, you may make it relate the trigger pattern of the trigger pattern name TP 2, and the accompaniment pattern of the pattern name PP 3 with a drum pad 22.

[0184] Moreover, in the above-mentioned gestalt of operation, although the trigger pattern of four different classes and the accompaniment pattern of four different classes were related with four drum pads As for the number of a drum pad, the class of trigger pattern, and the class of accompaniment pattern, it is needless to say that it does not need to be in agreement, without being restricted to this. For example, the trigger pattern of two different classes and the accompaniment pattern of three different classes are set to four drum pads, and you may make it relate the trigger pattern of the same class, or the accompaniment pattern of the same class with two or more drum pads.

[0185] Moreover, in the above-mentioned gestalt of operation, although one drum pad and the trigger pattern of one class are associated by correspondence of 1 to 1 Of course [ without being restricted to this ], you may make it relate the trigger pattern of two or

more classes with one drum pad. In that case The data configuration (refer to drawing 5 ) and the various registers (refer to drawing 7 ) for every drum pad of a variable group of RAM shall be set up according to the number of the classes of trigger pattern. [ of a memory area ]

[0186] Moreover, although the automatic performance carried out for carrying out according to the accompaniment pattern which relates the accompaniment pattern with the drum pad and was related with the drum pad the blow pattern and whose trigger pattern corresponded in the above-mentioned gestalt of operation Namely, although it was made to direct an accompaniment pattern corresponding to a drum pad You may be the information which directs a switch of the accompaniment pattern instead of information with which that of **** with relation directs an accompaniment pattern at a drum pad, without being restricted to this. It is good even if an automatic performance will be performed according to the automatic performance pattern switched by directions of a switch of the accompaniment pattern related with the drum pad the blow pattern and whose trigger pattern corresponded.

[0187] for example, associate the information which carries out the sequential storage of the advance of an accompaniment pattern beforehand, and directs a switch to the following accompaniment pattern to a drum pad, or moreover, associate the information which directs a switch to other accompaniment patterns related with the drum pad by the accompaniment pattern by which the current automatic performance is carried out, or Moreover, after switching to a drum pad temporarily to other accompaniment patterns relevant to the accompaniment pattern by which the current automatic performance is carried out, you may make it associate the information which directs a switch to the accompaniment pattern of a basis.

[0188]

[Effect of the Invention] This invention does so the outstanding effectiveness of the flume which can switch an automatic performance pattern, without spoiling the performance nature of the percussion instrument performance by the player, since it is constituted as explained above.

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## CLAIMS

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[Claim(s)]

[Claim 1] In the electronic percussion instrument which generates musical sound according to the blow to the drum pad equipped with the blow side A trigger pattern storage means to memorize a trigger pattern corresponding to each of two or more drum pads equipped with the blow side, and two or more of said drum pads, respectively, An automatic performance pattern storage means to memorize two or more automatic performance patterns, and the blow pattern of the drum pad hit among said two or more drum pads, A comparison means to compare the trigger pattern corresponding to the drum pad hit in the trigger pattern memorized by said trigger pattern storage means, The blow pattern of the drum pad with which the comparison result by said comparison means was hit among said two or more drum pads, When coincidence with the trigger pattern corresponding to the drum pad hit in the trigger pattern memorized by said trigger pattern storage means is shown The switch means which switches the automatic performance pattern under automatic performance to the automatic performance pattern

of either of the automatic performance patterns memorized by said automatic performance pattern storage means, The electronic percussion instrument which has an automatic performance means to perform an automatic performance according to the automatic performance pattern switched by said switch means.

[Claim 2] In the electronic percussion instrument which generates musical sound according to the blow to the drum pad equipped with the blow side A blow pattern storage means to memorize the blow pattern of two or more drum pads equipped with the blow side, and the drum pad hit among said two or more drum pads, A trigger pattern storage means to memorize a trigger pattern corresponding to each of two or more of said drum pads, respectively, An automatic performance pattern storage means to memorize an automatic performance pattern corresponding to each of two or more of said drum pads, respectively, A comparison means to compare the blow pattern memorized by said blow pattern storage means with the trigger pattern corresponding to the drum pad hit in the trigger pattern memorized by said trigger pattern storage means, The blow pattern with which the comparison result by said comparison means was memorized by said blow pattern storage means, When coincidence with the trigger pattern corresponding to the drum pad hit in the trigger pattern memorized by said trigger pattern storage means is shown The electronic percussion instrument which has an automatic performance means to perform an automatic performance according to the automatic performance pattern corresponding to the pad hit in the automatic performance pattern memorized by said automatic performance pattern storage means.

[Claim 3] an electronic percussion instrument given in any 1 term of claim 1 or claim 2 -- the electronic percussion instrument which has the 1st setting means which it is, and two or more of said drum pads are alike, respectively, corresponds, and sets said trigger pattern as said trigger pattern storage means, respectively, and the 2nd setting means which two or more of said drum pads are alike, respectively, corresponds, and sets said automatic performance pattern as said automatic performance pattern storage means, respectively.

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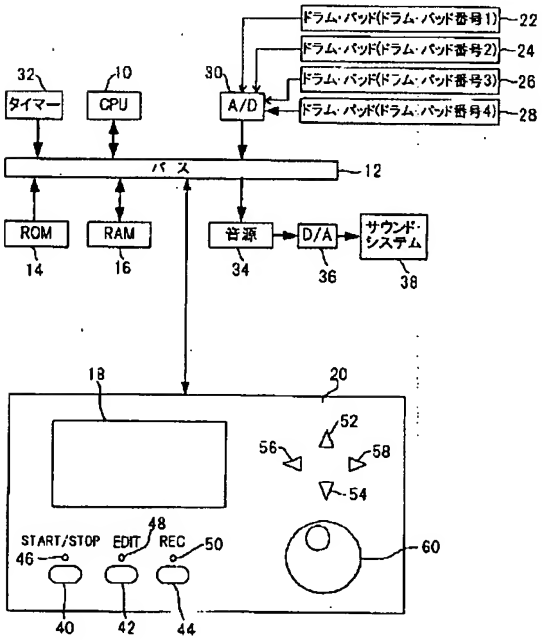
[Translation done.]

【図２】パッド・バッファのデータ構造を図表的に示す説明図である。
【図３】トリガー・パターンのデータ構成の一例ならびにトリガー・パターンのクロック・タイミング・データの示す楽譜を示す説明図である。
【図４】伴奏パターンのデータ構造を図表的に示す説明図である。
【図５】ドラム・パッドごとの変数群のデータ構造を図表的に示す説明図である。
【図６】ドラム・パッドとトリガー・パターンと伴奏パターンとの関連付けを概念的に示す説明図である。
【図７】ＲＡＭの各種レジスタ群のデータ構造を図表的に示す説明図である。
【図８】レジスタｐａｄｒｅｇ（パッド・レジスタ）のデータ・フォーマットを図表的に示す説明図である。
【図９】メイン・ルーチンを示すフローチャートである。
【図１０】パッド割り込み処理ルーチンを示すフローチャートである。
【図１１】タイマー割り込み処理ルーチンを示すフローチャートである。
【図１２】比較処理ルーチンを示すフローチャートである。

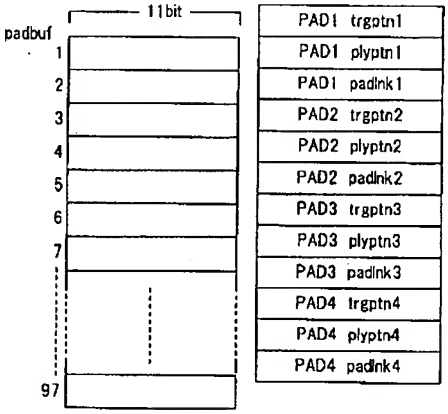
【符号の説明】

| | |
|---|---|
| １０ | 中央処理装置（ＣＰＵ） |
| １２ | バス |
| １４ | リード・オンリ・メモリ（ＲＯＭ） |
| １６ | ランダム・アクセス・メモリ（ＲＡＭ） |
| １８ | 表示器 |
| ２０ | 操作パネル部 |
| ２２ | ドラム・パッド（ドラム・パッド番号１） |
| ２４ | ドラム・パッド（ドラム・パッド番号２） |
| ２６ | ドラム・パッド（ドラム・パッド番号３） |
| ２８ | ドラム・パッド（ドラム・パッド番号４） |
| ３０ | アナグロ／デジタル変換器（Ａ／Ｄ） |
| ３２ | タイマー |
| ３４ | 音源 |
| ３６ | デジタル／アナグロ変換器（Ｄ／Ａ） |
| ３８ | サウンド・システム |

【図１】




【図２】



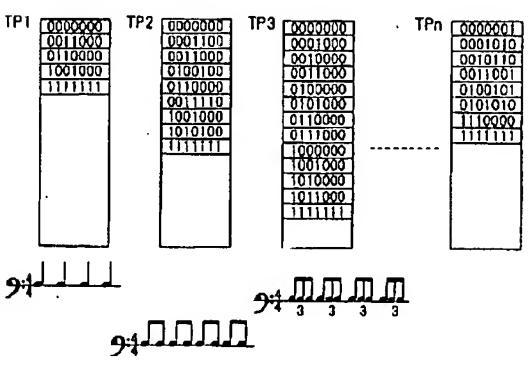

【図５】

| |
|---|
| PAD1 trgptn1 |
| PAD1 plyptn1 |
| PAD1 padlnk1 |
| PAD2 trgptn2 |
| PAD2 plyptn2 |
| PAD2 padlnk2 |
| PAD3 trgptn3 |
| PAD3 plyptn3 |
| PAD3 padlnk3 |
| PAD4 trgptn4 |
| PAD4 plyptn4 |
| PAD4 padlnk4 |

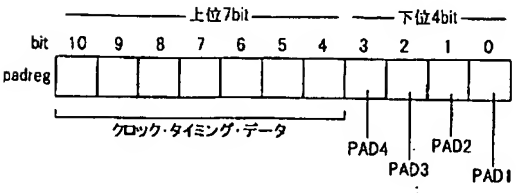
【図７】

| |
|---|
| statusreg |
| padbufptr |
| trgptnptr1 |
| trgptnptr2 |
| trgptnptr3 |
| trgptnptr4 |
| plyptnptr |
| trgmuch |
| clk |
| padreg |

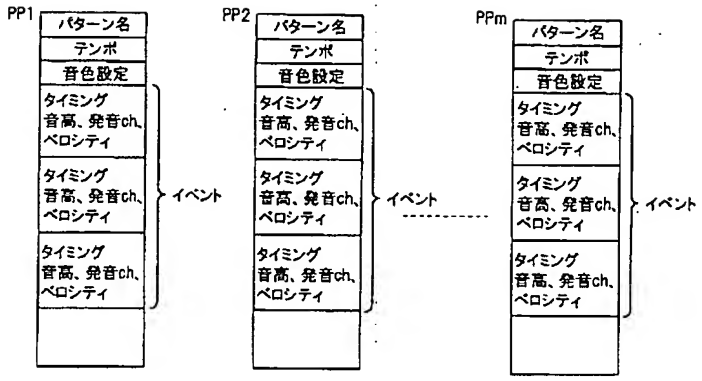
【図３】



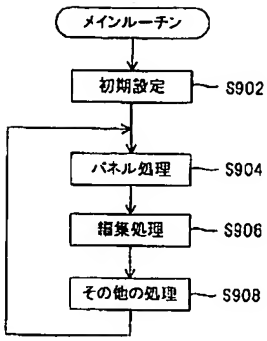

【図８】



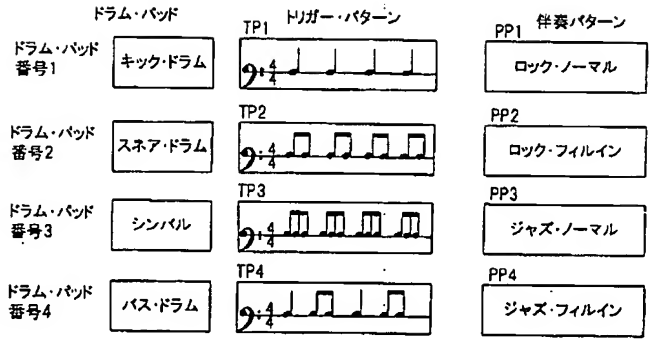
【図4】


PP1
パターン名
テンポ
音色設定
タイミング
音高、発音ch、
ベロシティ
タイミング
音高、発音ch、
ベロシティ
タイミング
音高、発音ch、
ベロシティ
イベント
PP2
パターン名
テンポ
音色設定
タイミング
音高、発音ch、
ベロシティ
タイミング
音高、発音ch、
ベロシティ
タイミング
音高、発音ch、
ベロシティ
イベント
PPm
パターン名
テンポ
音色設定
タイミング
音高、発音ch、
ベロシティ
タイミング
音高、発音ch、
ベロシティ
タイミング
音高、発音ch、
ベロシティ
イベント

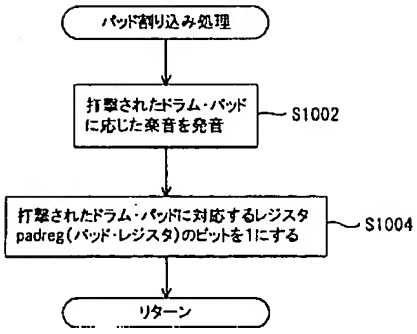
【図9】


メインルーチン
初期設定
S902
パネル処理
S904
編集処理
S906
その他の処理
S908

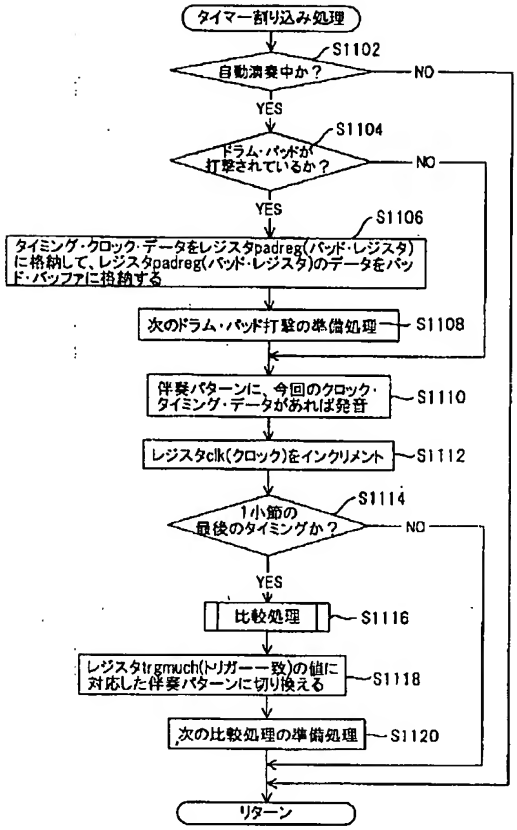
【図6】


ドラム・パッド
トリガー・パターン
伴奏パターン
ドラム・パッド
番号1
キック・ドラム
TP1
PP1
ロック・ノーマル
ドラム・パッド
番号2
スネア・ドラム
TP2
PP2
ロック・フィルイン
ドラム・パッド
番号3
シンバル
TP3
PP3
ジャズ・ノーマル
ドラム・パッド
番号4
バス・ドラム
TP4
PP4
ジャズ・フィルイン

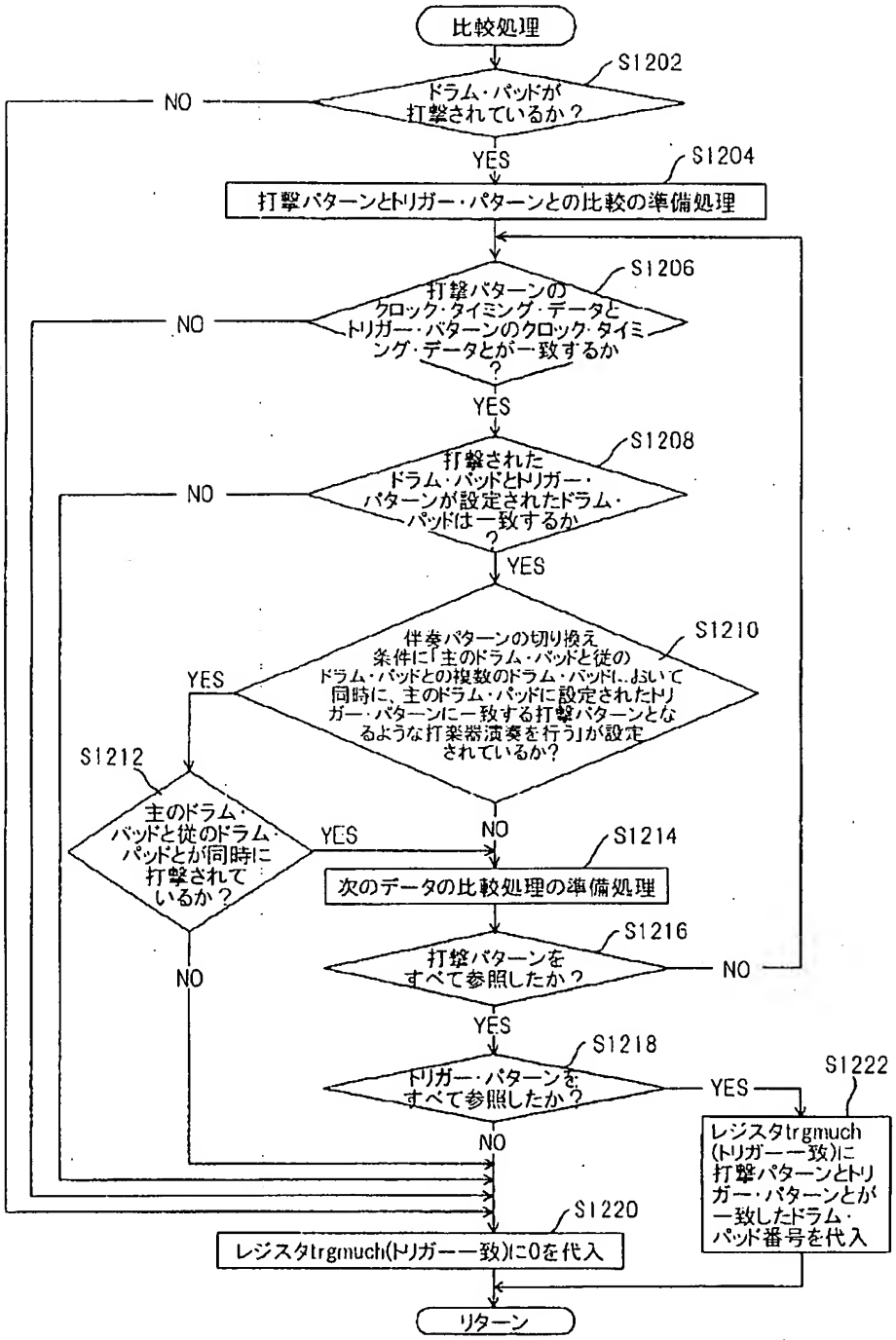
【図10】


パッド割り込み処理
打撃されたドラム・パッド
に応じた楽音を発音
S1002
打撃されたドラム・パッドに対応するレジスタ
padreg(パッド・レジスタ)のビットを1にする
S1004
リターン

【図11】


タイマー割り込み処理
S1102
自動演奏中か？
NO
YES
S1104
ドラム・パッドが打撃されているか？
NO
YES
S1106
タイミング・クロック・データをレジスタpadreg(パッド・レジスタ)に格納して、レジスタpadreg(パッド・レジスタ)のデータをパッド・バッファに格納する
次のドラム・パッド打撃の準備処理
S1108
伴奏パターンに、今回のクロック・タイミング・データがあれば発音
S1110
レジスタclk(クロック)をインクリメント
S1112
S1114
1小節の最後のタイミングか？
NO
YES
比較処理
S1116
レジスタtrgmuch(トリガー一致)の値に対応した伴奏パターンに切り換える
S1118
次の比較処理の準備処理
S1120
リターン

【図12】


比較処理
S1202
ドラム・パッドが打撃されているか？
NO
YES
S1204
打撃パターンとトリガー・パターンとの比較の準備処理
S1206
打撃パターンのクロック・タイミング・データとトリガー・パターンのクロック・タイミング・データとが一致するか？
NO
YES
S1208
打撃されたドラム・パッドとトリガー・パターンが設定されたドラム・パッドは一致するか？
NO
YES
S1210
伴奏パターンの切り換え条件に「主のドラム・パッドと従のドラム・パッドとの複数のドラム・パッドにおいて同時に、主のドラム・パッドに設定されたトリガー・パターンに一致する打撃パターンとなるような打楽器演奏を行う」が設定されているか？
YES
S1212
主のドラム・パッドと従のドラム・パッドとが同時に打撃されているか？
YES
NO
NO
S1214
次のデータの比較処理の準備処理
S1216
打撃パターンをすべて参照したか？
NO
YES
S1218
トリガー・パターンをすべて参照したか？
YES
NO
S1222
レジスタtrgmuch(トリガー一致)に打撃パターンとトリガー・パターンとが一致したドラム・パッド番号を代入
S1220
レジスタtrgmuch(トリガー一致)に0を代入
リターン